TECHNICAL REVIEW HANDBOOK

Version 1.04

April 2009

Executive Summary

The Engineering Competency Leadership Board prepared this document to assist Program Managers and improve the application of Systems Engineering principals throughout Marine Corps Systems Command. This handbook provides guidance on the preparation and conduct of technical reviews throughout a program's lifecycle.

Technical reviews are conducted during development and verification of a new system or system baseline upgrade to demonstrate that required tasks have been successfully completed before proceeding beyond critical events. This ensures a disciplined and orderly approach to the development and verification process. Technical reviews are an integral part of the systems engineering process and are consistent with existing and emerging commercial standards. Tailoring of each review ensures that the emerging design is ready to enter the next development stage. Reviews should be event-driven and conducted when the system's design is ready for review of progress in accordance with appropriate technical plans. Accordingly, for each review, entry and exit criteria tied to the required level of design maturity must be defined and certified and they must be applied across all requirements and technical disciplines. Technical reviews will be chaired by an independent Chairperson appointed by the Deputy Commander Systems Engineering, Interoperability, Architectures and Technologies for all programs. Program Managers may co-chair or assign a review co-chairperson if desired. The technical review will also make maximum use of subject matter experts from outside the Program Team.

This Technical Review Handbook describes the purpose, timing, entrance and exit criteria for each technical review in the overall technical review process. Program Managers have the flexibility to tailor reviews to the particular circumstances of each program. Each Program Manager will develop and deliver a Systems Engineering Plan that describes how the program intends to tailor the technical reviews and how the tailored review activities accomplish the objectives of the overall technical review process.

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1 Introduction

1.1 Purpose

The Engineering Competency Leadership Board prepared this document to assist Program Managers and Project Officers with the application of Systems Engineering principals throughout Marine Corps Systems Command (MCSC) and Program Executive Officer (Land Systems) (PEO-LS) programs. This handbook is directive for all programs within MCSC and PEO-LS.

This Technical Review Handbook (TRH) identifies technical requirements, planning responsibilities, recording requirements, and roles for technical reviews. This handbook also describes the objectives and activities (agenda, entry and exit criteria, etc.) for each technical review as well as the overall technical review process. The technical review should not be limited to an assessment of the technical products; it should also assess the programmatic readiness of the development and testing efforts that lie ahead.

1.2 References

This handbook does not attempt to describe the full Systems Engineering process. The focus of this handbook is on the technical review process as described in one or more of the following:

- Defense Acquisition Guidebook, 24 Jul 2006

- Defense Acquisition University Systems Engineering Community of Practice, <acc.dau.mil/se>

- NAVAIRINST 4355.19C Systems Engineering Technical Review Process, 10 Apr 2006

- NAVAIR Systems Engineering Technical Review Handbook, 10 Apr 2006

- Marine Corps Systems Command Develop and Demonstrate Process Handbook and Quick Tips, version 2, Jul 2004

- Defense Systems Management College Systems Engineering Fundamentals, Jan 2001

In addition, this handbook derived many of its review elements and entrance and exit criteria from MIL-STD-1521B (USAF) Military Standard Technical Reviews and Audits for Systems, Equipments, and Computer Software. Although this MIL-STD has been cancelled, program managers may find it a useful resource.

1.3 Technical Review Background

Technical reviews provide visibility into the developer's implementation of the work effort required under the terms of a contract's Statement of Work to assure timely and effective attention to the technical interpretation of contract requirements. As a system progresses

through design and development, the system-level technical reviews are generally timed to correspond with transition from one stage of development to another. Technical reviews are the events at which the Program Manager verifies that the technical maturity of the system or item under review is sufficient to justify commitment of resources to go to the next stage of development.

As the system/product progresses through the development process, the focus of the technical assessment changes. Early in the process, the primary focus is on defining the requirements that drive design and development activities. Technical reviews conducted during the early stages of development usually focus on ensuring that top-level concepts and system definitions reflect user requirements. Once system-level definition is complete, the focus is on design at sub-system levels and below.

Technical reviews during these stages are typically design reviews that establish design requirements and then verify that physical solutions are consistent with those requirements. Schedule technical reviews and audits at strategic, event-driven points representing a transition in design focus or phase. Describe the establishment and tailoring of technical review schedules in the program's Systems Engineering Plan (SEP).

1.4 Objectives

Assess system design progress and maturity at key development stages that are event-driven points in the acquisition development schedule. Compare the design to pre-established exit criteria for the particular event to determine if the appropriate level of maturity has been achieved. These events are the technical reviews and audits. The objectives of these reviews are to:

- Ensure that the results of trade studies used to define concepts and risk associated with alternatives have been analyzed.

- Assess the system requirements and allocations to ensure that requirements are unambiguous, consistent, complete, feasible, verifiable, and traceable to top-level requirements.

- Assess the design maturity based on technical development goals, systems engineering events and accomplishments, and empirical test data supporting progress to date.

- Confirm that the effects of technical risk on cost, schedule, and performance, as well as risk reduction measures, rationale, and assumptions made in quantifying the risks have been addressed.

- Demonstrate that the relationships, interactions, interdependencies, and interfaces between required items and externally interfacing items, system functions, subsystems, and system elements, as appropriate, have been addressed.

- Ensure performance, functional, design, cost, and schedule requirements and objectives, technical performance measurements, and technical plans are being

tracked, are on schedule, and are achievable within existing programmatic constraints.

- Confirm that continued development is warranted, and when it is not, that executable alternatives have been defined (discontinue development, or take corrective action on the products and/or processes of the current application before proceeding to the next application).

- Verify the system is ready for testing or production.

- Identify resources (people, funding, support assets, test facilities, etc., as appropriate) required for continued development, testing or production.

Precede formal technical reviews by a series of technical interchange meetings where the developer and the Government identify and discuss issues, problems and concerns, and define solutions to mitigate these problems. The formal technical review is not the place for problem solving, but for verifying that problem solving has been done and the approved system engineering process has been followed. Figure 1. summarizes the technical review event process.
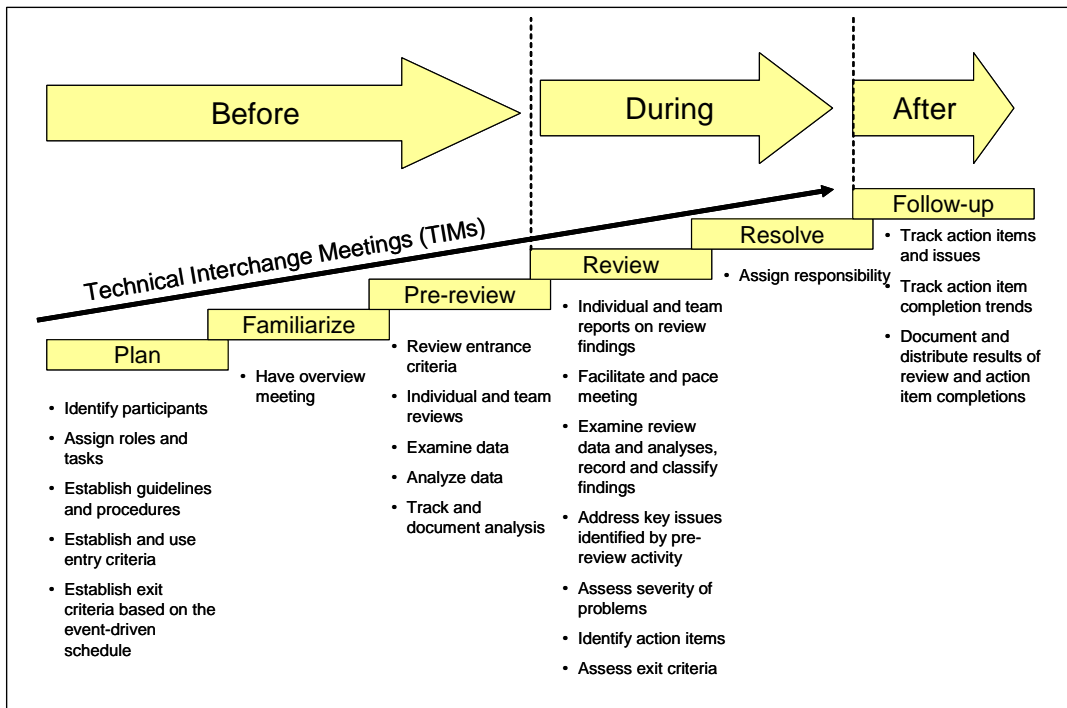

Figure 1: Technical Review Event Process

## 1.5 Recommended Technical Reviews and Levels

The following paragraph describes the recommended technical reviews for a new system or baseline upgrade. Describe the program-specific technical reviews and any needed tailoring in the program's SEP. Incorporate technical review requirements into contracts where appropriate. A good source of contracting guidance is *Guide to Integrating Systems Engineering into DoD Acquisition Contracts*.

Appendices to this handbook provide suggested entrance and exit criteria as well as agenda items and timing guidance for each of the reviews listed below. Sections 2.13 and 2.15 of this document more fully addressed Entrance and Exit Criteria. The sequence of system and subsystem reviews may be altered as appropriate for the program, consistent with sound engineering practice. Section 2.1.1 discusses tailoring of technical reviews. Appendix C provides a listing of documentation that corresponds to each technical review.

- System Requirements Review (SRR) (system level)

- System Functional Review (SFR) (system level)

- Preliminary Design Review (PDR) (both system and subsystem level)

- Critical Design Review (CDR) (both system and subsystem level)

- Test Readiness Review (TRR) (subsystem level)

- System Verification Review (SVR) (system level)

- Production Readiness Review (PRR) (system level)

- Physical Configuration Review (PCR) (system level)

1.6 Timing

The schedule for technical reviews is extremely important. Conduct a review too early, and the item for review will not be adequately defined. Conversely, a late review can result in erroneous program commitments whose correction will be both difficult and costly. For planning purposes, a good method for scheduling technical reviews is to relate them to the documentation requirements. For example, schedule a PDR after the Hardware Development Specification or Software Design Description and Software Test Plan are available, since the essence of the PDR is to assess the contractor's approach to meeting the requirements of these documents. Scheduling of reviews are dependent not only on documentation availability but also on hardware/software availability, and the completion of the acceptance qualification tests. Figure 2 illustrates where various technical reviews typically occur during the acquisition life cycle.

Systems Engineering Technical Review Timing
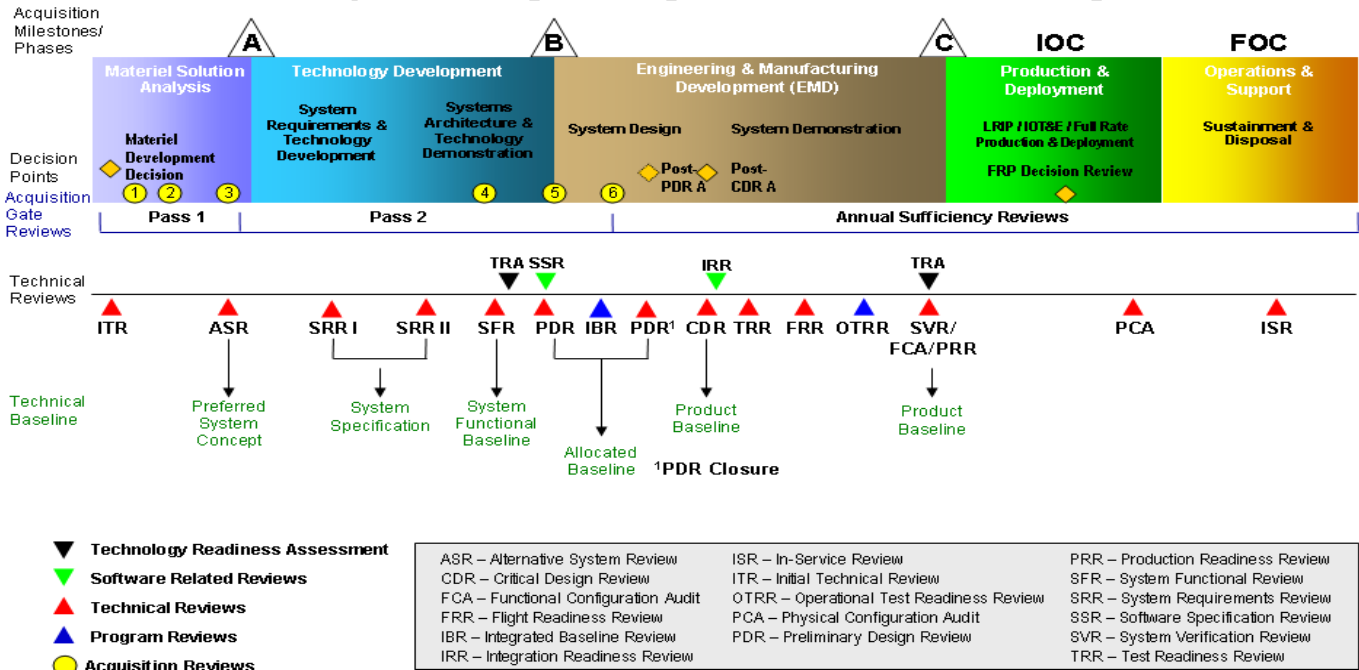
Program Initiation at Milestone A

Systems Engineering Technical Review Timing
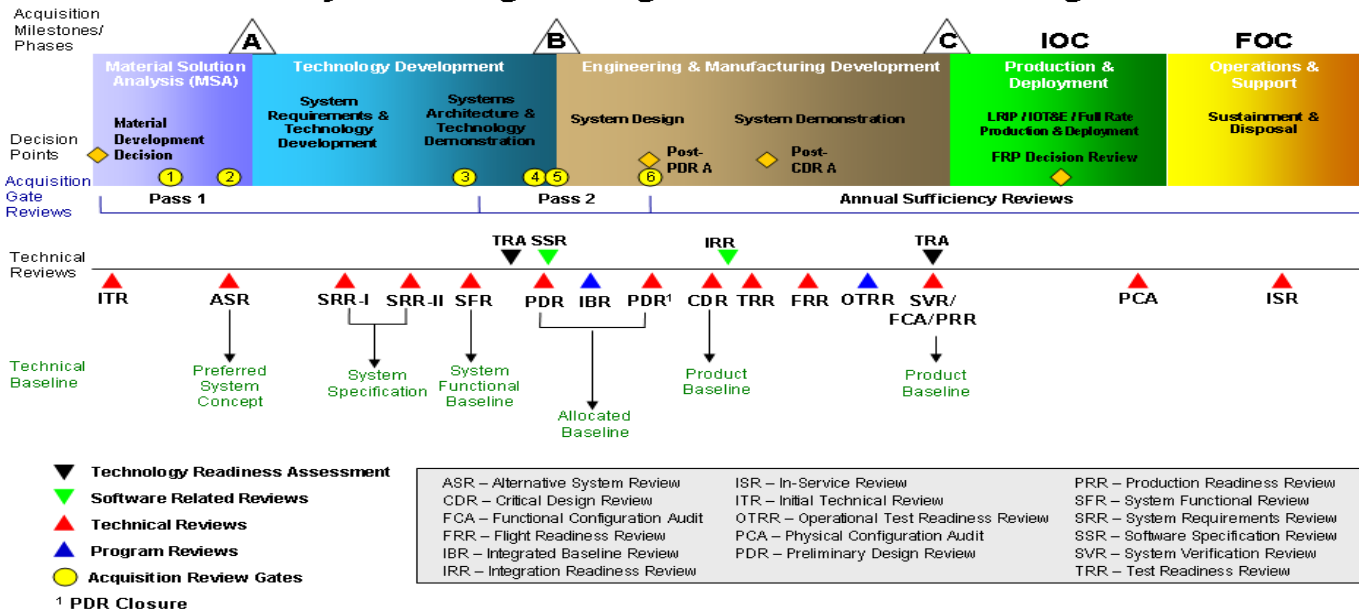
Program Initiation at Milestone B

Figure 2. Systems Engineering Technical Review Timing

2   Technical Review Planning

Reviews should consider the state of the developing product analyses, the ability to test, produce, and support the product, and the ability to train operators to use the system. The developer and the government should have the same expectations regarding the content and the outcome of the review. Important considerations for planning include the following:

- Timely and effective preparation for the review

- Identifying and allocating resources necessary to accomplish the total review effort

- Tailoring of the review consistent with program risk levels

- Scheduling consistent with availability of appropriate data

- Establishing event-driven entrance and exit criteria

- Establishing boundaries to define the review's content

- Using appropriate incremental reviews

- Reviewing all systems functions

- Confirming all system elements are integrated

2.1   Technical Review Action Plan

Prior to the technical review the Program Team will prepare a Technical Review Action Plan. It is an important tool to manage the expectations of external stakeholders and it clearly communicates to the contractor team the government's expectations and success criteria. The Action Plan must be consistent with the technical review approach defined in the program's Systems Engineering Plan.

The Technical Review Action Plan should contain the following:

- Program Background

- Tailoring of technical review guidance (Section 2.1.1)

- Schedule of events leading to the technical review (including incremental sub-systems technical reviews and readiness assessments)

- Technical review Board Membership and technical review Participants (Section 2.1.2)

- Entrance Criteria (to include closeout of Request For Actions (RFA) from previous reviews and having met exit criteria of previous reviews) (Section 2.1.3)

- Proposed Agenda, elements to be reviewed, and boundary conditions (Section 2.1.4)

- Exit Criteria (Section 2.1.5)

- The RFA process that will be used to document the technical review's action items. (Section 4)

2.1.1 Tailoring

The complexity of the System, Subsystem, or configuration item and the type of program are central in determining both the need for and the number of reviews. When developing a small non-complex system some reviews may not be required, or, if required, may be limited in scope. Conversely, in a very complex development the review process will increase in levels and numbers of reviews. The tailoring of reviews enables the Program Manager (PM) to focus on an appropriately scoped technical review.

Tailor each technical review's agenda, entrance and exit criteria in accordance with the technical scope and risk of the system; described any tailoring in the program's SEP.

2.1.2 Technical Review Board Mission, Membership and Participants

The Technical Review Board (TRB) is the government body formed to conduct the technical review to the objectives shown in Section 1.4 and the exit criteria developed during technical review planning (see Section 2.1.5). The TRB advises the TRB Chairperson, or Co-chairpersons, who makes a recommendation(s) to the Program Manager on whether the program is ready to proceed to the next stage of development (see Section 3.1.2).

Note

TRB is the generic name that applies to all of the various reviews listed in Section 1.5. In practice, the review board is known by the name of the review (e.g. the PDR Board, the CDR Board, etc.). The TRB and the event (PDR, CDR, etc.) are not separate.

TRB Membership (typical composition):

- Technical Review Board Chairperson or Co-chairpersons (see Section 2.1.2.1)

- Competency Lead Engineers, as appropriate. When there are interfacing or supporting systems the appropriate Competency Lead Engineers will be added to the TRB.

- Program Manager or representatives (Industry and Government)

- The program's Lead Engineer,

- The program's Lead Logistician, who should ensure all relevant supportability requirements are addressed

- Cost Team representative, if required

- Counsel, if required

- Contracting Officer, if required

- Recorder; who is responsible for collating RFAs for submission to the TRB. The recorder should have the Technical Review Summary Report (section 3.1.2) prepared for distribution by the Chairperson

Other participants that are not part of the TRB but who represent stakeholders or who support the TRB:

- Resource Sponsor (Requirements Officer from Marine Corps Combat Development Command (MCCDC)

- User representatives

- Marine Air-Ground Task Force (MAGTF) and Joint Integration Division within Systems Engineering, Interoperability, Architectures and Technology (SIAT)

- Independent Subject Matter Experts (SMEs) as required to address system concepts and enabling technologies. These SMEs represent their MCSC functional areas in the adjudication of RFAs, to include cost and schedule impacts. These assignments should be coordinated with engineering authority. SMEs should be notified at least 30 days prior to the scheduled review date

- Developmental and Operational testers (DT/OT)

- Integrated Product Team (IPT) member/briefer in accordance with the technical review agenda

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Best Practice

The participation of SMEs from outside the program team is important to a successful Technical Review. SMEs from interfacing systems are especially important. To convince senior leaders that the proper SMEs will participate, the Technical Review Action Plan should list, by name, the SMEs that will attend the Technical Review. A brief synopsis of each SMEs experience and qualifications should also be included.

2.1.2.1 Technical Review Board Chairperson

Program Executive Officer – Land Systems (PEO-LS), Product Group Director (PGD), and Independent Program Managers (IPM) will request that the Deputy Commander, Systems Engineering, Interoperability, Architectures and Technology (DC SIAT), as MARCORSYSCOM CHENG, assign a TRB Chairperson who is independent of the program team. On programs where Commander, MARCORSYSCOM had delegated Milestone Decision Authority (MDA) to a lower level, the CHENG may assign the Competency Lead Engineer (CLE) as the TRB Chairman. The Program Manager may co-chair or assign the

program's Lead Engineer or another individual to serve as a Co-chairperson. The role of the chairperson includes**:**

- Review and approval of the Technical Review Action Plan, which includes:

    1. TRB membership (see section 2.1.2) based on the program's content

    2. Final review elements (see section 2.1.4)

    3. Entrance and exit criteria (see sections 2.1.3 and 2.1.5)

- Oversight of the technical review and RFA process (see section 4) as documented in the program's SEP and the Technical Review Action Plan

- Issuance of the Technical Review Summary Report (see section 3.1.2).

2.1.2.2 Program Lead Engineer

The role of the program lead engineer includes:

- Ensure the performing activity provides the supporting data and participation in the required review

- Develop, coordinate, and execute, in cooperation with the performing activity, individual review arrangements

- Ensure that all program documentation relevant to the technical review is coordinated across the IPTs

- Conduct the review for the TRB

2.1.3 Entrance Criteria

Establish entrance criteria early, prior to the scheduled review. This ensures that the review is event driven, not schedule driven. Derive the criteria from the program plan and capture the work that must be accomplished during the phase preceding the review. Entrance criteria have a quantitative characteristic, measuring accomplishments. "Reverse Engineering" the criteria at the last minute based on what has been accomplished defeats the purpose of the technical review. Entrance criteria answer the question, "Has the developer completed those things that were planned to be accomplished?" Start the technical review with a review of the developer's response to the entrance criteria. For each entrance criteria, what objective evidence has the developer submitted to demonstrate that the criteria has been satisfied? Address how qualified, impartial, reviewers have evaluated the evidence. Example entrance criteria for each technical review are included in the corresponding review's appendix to this handbook.

2.1.4 Technical Review Elements and Agenda

The program's lead engineer and the assigned Chairperson shall coordinate the development of a preliminary agenda containing elements that correlate to the established exit criteria. Make this agenda available to the TRB participants 30 days prior to conduct of the review. In addition, the program team needs to decide what products (i.e., design documents, test plans and reports, management plans, and risk assessments) will be reviewed prior to the technical review. These products may consist of items such as, but not limited to, any or all of the following: design documents, analysis results, test plans and reports, management plans, and risk assessments as necessary to provide a comprehensive overview of work accomplished to date. A list of the products to be reviewed should be included in the Technical Review Action Plan. Appendices to this handbook contain sample review elements for each of the technical reviews.

2.1.5 Exit Criteria

While entrance criteria have a quantitative characteristic, measuring accomplishments, exit criteria will answer the question, "Is the accomplished work of sufficient quality and completeness to warrant moving forward to the next phase?" Coordinate the exit criteria with the developer and keep them within scope of the development effort. Setting unrealistic criteria may doom the technical review to failure. Likewise, setting criteria that do not adequately measure readiness to proceed adds risk to the program in the long run. Example exit criteria for each technical review are included in the appendices of this handbook.

Best Practice

Write a proof statement for each exit criteria then map the exit criteria to the agenda to ensure that each is covered during the technical review. For example, for a CDR exit criteria, a proof statement and the associated agenda items might read:

Exit Criteria: "Is the design capable of meeting the performance requirements?"

Proof Statement; "The contractor will brief the flow-down of requirements from the contract specification to the allocated baseline and will include the current program manager's estimate of performance against the contract specification."

Agenda Items Supporting this criteria: Mr. Smith's briefing on requirements flow-down process, Ms. Jones' briefing on the current performance estimates

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2.2 Staffing and Technical Review Preparation

Start planning the technical review well in advance of the event. Project Officers should work with the developer, the Competency Lead Engineer, and other members of the program team to develop the Technical Review Action Plan. At the same time, Program Management should request the designation of a Technical Review Board Chairperson. Once a working group prepares an initial draft, it should be formally coordinated with the Chairperson and other stakeholders. Also send the Technical Review Action Plan to all members of the technical review board (see section 2.1.2). Figure 3 shows a typical timeline for this staffing process.

At least 45 days prior to the event, assess the entrance criteria and the overall preparation. Do this to ensure that sufficient progress is being made toward meeting the published entrance criteria. For unmet entrance criteria, put mitigation plans in place and review them as part of technical review.
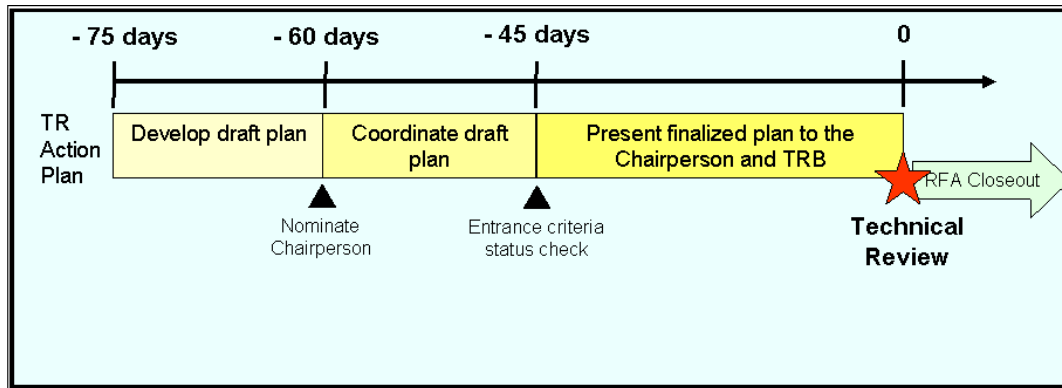
Figure 3. Planning Timeline

3 Conduct of the Technical Review

Just as no two programs are alike, no two technical reviews will be conducted the same way. For some complex programs, the technical review may be broken down into incremental reviews where SMEs from various disciplines each have a chance to review the appropriate part of the program. For other, less complex, programs a single review over a few days may be more appropriate. The PM may want to have smaller groups, or breakout sessions, examine specific risk areas and then have a general, executive-level, session to receive the smaller group's findings and to review the program's readiness to proceed. There is no single approach to conducting a technical review.

No matter what approach is chosen, the critical focus must remain on demonstrating achievement of established exit criteria. There should be a direct correlation between the exit criteria and the agenda topics.

Best Practice

At the start of the technical review the Technical Review Board Chairperson should set the context for the review. Firmly establishing expectations and boundaries will focus the discussion and keep attendees from revisiting decisions made at previous reviews. Presenting a "we are here" chart showing the technical review in relation to the overall program schedule and the technical review process will also focus the attendees and provide an overall context. Do not assume that all participants have equal background knowledge of the program. Time spent at the outset to baseline everyone will pay dividends later in the review.

> ### *Best Practice*
>
> At the start of the technical review, review the entrance criteria to justify the program's readiness to hold the technical review.

> ### *Best Practice*
>
> At the beginning of the technical review the exit criteria should be briefed and each subsequent briefing should explicitly state which exit criteria is being addressed.

> ### *Best Practice*
>
> Brief the participants on the RFA process that will be used to document action items (see section 4) and provide hardcopies of the RFA forms.

3.1.1 Closing the Technical Review

In general, a technical review is considered closed when the event is complete, established exit criteria have been met and all critical RFAs have been closed (see section 4 for a discussion of Requests For Action). Obtain concurrence of the TRB Chairperson, or Co-chairpersons, with a formal determination that the technical review is closed. These closeout criteria usually form the first two entrance criteria for the next technical review.

If exit criteria remain unmet at the end of the event, the Technical Review Board Chairperson (see section 2.1.2.1) must decide whether to address them at a future meeting such as a program review, a follow-on session of the technical review, or, in extreme cases, to reconvene the technical review and start over. Whatever approach the Chairperson chooses it should become part of the recommendation passed to the Program Manager (see section 3.1.2).

3.1.2 Technical Review Summary Report

At the conclusion of the technical review, the Recorder prepares a Technical Review Summary Report. This report documents the outcome of the review and should include the following items:

- List of attendees, to include; name, functional area represented, phone number, and email address

- Meeting minutes, including Entrance Criteria status, Technical Review results and Exit Criteria status

- Completed RFA forms

- The TRB Chairman's recommendation to the Program Manager on the technical readiness of the program to enter the next phase of development

Forward the Technical Review Summary Report and the technical review results to DC, SIAT, Assistant Commander, Programs (ACPROG), the Competency Lead Engineer, the Program Manager, and the Milestone Decision Authority, within 30 days of completion of the review.

4 Request For Action Process

The use of a formal Request For Action/Request for Information (RFA/RFI) process is important for the orderly conduct of any technical review. While action items are routinely assigned during program team meetings and are worked by team members, the technical review requires a more formal process. The large number of people who sometimes attend these reviews can inundate the program team with action items and requests for additional information; not all of which are critical to the completion of the review. By formalizing the action item process, many of these spurious actions are avoided and the critical issues are identified.

RFAs are used by SMEs reviewing documentation prior to the events as well as during the event. In the Technical Review Action Plan discuss how RFAs will be gathered from SMEs reviewing documents prior to the event as well as during the event. If the contractor will comment on these RFAs before the technical review, include this process in the Technical Review Action Plan.

Brief the use of RFAs/RFIs to the technical review participants at the outset of the technical review. This briefing should include the process for submittal, evaluation, tracking and closeout. Appendix K shows a sample RFA/RFI form. Make hardcopies of this form available to all technical review participants.

The Technical Review Board Recorder is responsible for collecting all submitted RFAs/RFIs. The Technical Review Board, usually in an executive session, evaluates, accepts or rejects, and classifies all RFAs/RFIs. Assign submitted RFAs/RFIs to one of the following classifications:

- **Critical RFA.** In identifying a RFA as critical, Technical Review Board Members must apply reasonable judgment as to whether failure to complete a specific action (e.g., resolving a predicted performance shortfall) is serious enough to prevent closure of the review. Examples of RFAs that may be critical include those associated with missing or incomplete design definition, performance shortfalls, design deficiencies, incomplete performance assessments, failure to satisfy exit criteria/objectives, design not reproducible, insufficient risk mitigation, or other required design information deemed mandatory to proceed into the next phase. **All Critical RFAs must be closed before formally closing out the technical review.**

- **Non-Critical RFA.** Non-critical RFA's are those not considered mandatory for satisfaction of the technical review exit criteria. Careful scrutiny of these RFAs is

required by review chairpersons to ensure the proper classification as non-critical and the assignment of the proper need dates and/or milestone.

- **RFI.** Requests for additional information should be classified as RFIs, if they do not require the development team to perform any action other than to provide the information. If the requested information is crucial to evaluating the design or is a Contract Data Requirements List (CDRL) item that is required for submission at the technical review, the request should be classified as an RFA.

- **Out of Scope/Response**. Sometimes submitted requests can not be met within the contract scope or are out of bounds for the current technical review. Reject these requests.

Appendix A: Acronyms

ACPROG	Assistant Command, Programs
ASR	Alternate Systems Review
CDD	Capabilities Description Document
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CI	Configuration Item
CM	Configuration Management
CPD	Capabilities Production Document
CSCI	Computer Software Configuration Item
CSDM	Computer System Diagnostic Manual
CSOM	Computer System Operator's Manual
CRISD	Computer Resources Integrated Support Document
DC SIAT	Deputy Commander, Systems Engineering, Interoperability, Architectures and Technology
DoD	Department of Defense
DT&E	Developmental Test and Evaluation
DT/OT	Developmental Test/Operational Test
ECP	Engineering Change Proposal
ESOH	Environmental Safety and Occupational Health
FCA	Functional Configuration Audit
FoS/SoS	Family of Systems/System of Systems
FRP	Full Rate Production
HWCI	Hardware Configuration Item
IBR	Integrated Baseline Review
IDD	Interface Design Description
IPT	Integrated Product Team
IRS	Interface Requirements Specifications
ISP	Information Support Plan
ISR	In Service Review
ITR	Initial Technical Review
LRFS	Logistics Requirements Funding Summary
LRIP	Low Rate Initial Production
LSA	Logistics Support Analysis
MAGTF	Marine Air-Ground Task Force
MCCDC	Marine Corps Combat Development Command
MC-SAMP	Marine Corps Single Acquisition Management Plan
MCSC	Marine Corps Systems Command
NR-KPP	Net-Ready Key Performance Parameter
OPEVAL	Operational Evaluation
OTRR	Operational Test Readiness Review
PCR	Physical Configuration Review
PDR	Preliminary Design Review
PEO-LS	Program Executive Office – Land Systems
PGD	Product Group Director

PM	Program Manager
PRR	Production Readiness Review
RFA	Request For Action
RFI	Request For Information
SDD	System Development and Demonstration
SDD	Software Design Description
SDP	Software Development Plan
SE	Support Equipment
SEP	Systems Engineering Plan
SERD	Support Equipment Requirements Document
SFR	System Functional Review
SIAT	Systems Engineering, Interoperability, Architectures and Technology
SME	Subject Matter Experts
SRR	System Requirements Review
SRS	Software Requirements Specification
SSDD	System/Subsystem Design Document
STP	System/Software Test Plan
SUM	Software User's Manual
SV	System View
SVD	Software Version Description
SVR	System Verification Review
T&E	Test and Evaluation
TBD	To Be Determined
TDP	Technical Data Package
TLSU	Top-Level Software Unit
TRA	Technology Readiness Assessment
TRB	Technical Review Board
TRH	Technical Review Handbook
TRR	Test Readiness Review
TV	Technical View
VECP	Value Engineering Change Proposal

Appendix B: Document Definitions

This appendix defines the documents mentioned in this handbook.

Allocated Baseline. The approved documentation describing a Configuration Item's (CI's) functional, performance, interoperability, and interface requirements that are allocated from those of a system or higher level configuration item; interface requirements with interfacing configuration items; and the verifications required to confirm the achievement of those specified requirements.

Capability Development Document (CDD). The Capability Development Document captures the capabilities and performance requirements information necessary to develop a proposed program(s). The CDD outlines a militarily useful and logistically supportable capability.

Capability Production Document (CPD). The Capability Production Document (CPD) is a document used to address the production elements specific to a single increment of an acquisition program.

Configuration Management (CM) Plan. The plan describes the process for establishing and maintaining consistency of a product's performance, functional and physical attributes with its requirements, design and operational information throughout its lifecycle.

Computer System Diagnostic Manual (CSDM). The documentation needed to allow system administrator of a computer system to troubleshoot problems in a fielded system.

Computer System Operator's Manual (CSOM). The documentation needed to operate a given computer and its peripherals.

Computer Resources Integrated Support Document (CRISD). The CRISD provides the information needed to plan for life cycle support of deliverable software. The CRISD documents the contractor's plans for transitioning support of deliverable software to the support agency.

Database Design Document. The basis for database implementation and maintenance, including data base design; related data, files, and SW/data base management system for access.

Firmware Support Manual. The information required to program and re-program firmware devices in a system.

Functional Baseline. The approved documentation describing the system's functional, performance, interoperability, and interface requirements and the verifications required to demonstrate the achievement of those specified requirements

Hardware Development Specification. The item specification for a Hardware Configuration Item (HWCI) defines the performance and interface requirements and design and inter-operability constraints that have been allocated to the CI from a system or higher level CI. The Hardware Development Specification provides the contractual basis for the development and verification of HWCI performance. The Hardware Development Specification(s) will normally be used to establish the allocated baseline for the CI.

Hardware Product Specification. The item specification for a HWCI defines the performance and interface requirements and design and inter-operability constraints that have been allocated to the CI from a system or higher level CI. Item specifications provide the contractual basis for the development and verification of CI performance. An Hardware Product Specification or Hardware Performance Specification (essentially the same document) or a Hardware Detailed Specification (containing specific design requirements) is used to provide the contractual basis for acquisition of production quantities of the HWCI.

Interface Design Description (IDD). The IDD describes the interface characteristics of one or more systems, subsystems, Hardware Configuration Items, Computer Software Configuration Items, manual operations, or other system components. An IDD may also describe any number of interfaces. The IDD can be used to supplement the System/Subsystem Design Description or Software Design Description. The IDD and its companion Interface Requirements Specifications serve to communicate and control interface design decisions.

Interface Requirements Specification (IRS). The IRS specifies the requirements imposed on one or more systems, subsystems, Hardware Configuration Items, Computer Software Configuration Items, manual operations, or other system components to achieve one or more interfaces among these entities. An IRS can cover any number of interfaces. The IRS can be used to supplement the System/Subsystem Design Description (SSDD) and SRS as the basis for design and qualification testing of systems and Computer Software Configuration Items.

Information Support Plan (ISP). The ISP (formerly called the Command, Control, Communication, Computers, and Intelligence Support Plan (C4ISP)) is intended to explore the information-related needs of an acquisition program in support of the operational and functional capabilities the program either delivers or contributes to. The ISP provides a mechanism to identify and resolve implementation issues related to an acquisition program's Information Technology (IT), including National Security Systems (NSS), infrastructure support and IT and NSS interface requirements. It identifies IT needs, dependencies, and interfaces for programs in all acquisition categories, focusing attention on interoperability, supportability, synchronization, sufficiency and net-centricity concerns.

Logistics Requirements Funding Summary (LRFS). The LRFS identifies the product support functions and sub-functions required to establish affordable and effective product support. It identifies support resource requirements and the funds available to meet those requirements. The summary displays requirements versus available funding for all ILS elements and related disciplines, by fiscal year and appropriation, and is traceable to logistic support plan tasks and activities.

Marine Corps Single Acquisition Management Plan (MC-SAMP). The MC-SAMP is a MARCORSYSCOM initiative to assist Program Management Teams in the development of a single document that satisfies both the DoD/DoN acquisition management requirement to have an acquisition strategy document and the MARCORSYSCOM requirements to have a post-production systems management plan, as well as the requirements of Part 7 of the Federal Acquisition Regulation requirement that mandates the need for a written acquisition strategy and/or acquisition plan.

Manufacturing Plan. Plan documents methods by which design is to be built. Plan contains sequence and schedule of events at contractor and subcontractor levels that define use of materials, fabrication flow, test equipment, tools, facilities, and personnel. Plan also reflects consideration and incorporation of manufacturing requirements in the design process. It includes identification and assessment of design facilities.

Product Baseline. A CI's approved detail design documentation including those verifications necessary for accepting product deliveries (first article and acceptance inspections.) Based on program production/procurement strategies, the design information contained in the product baseline can be as simple as identifying a specific part number or as complex as full design disclosure.

Request For Action/Request For Information (RFA/RFI). A formal documentation of an action item initiated at a technical review. RFAs require some action on the part of the developer and can be either critical or non-critical. RFIs require only the providing of existing data.

Software Design Description (SDD). The SDD describes the design of a Computer Software Configuration Item (CSCI). Descriptions of the CSCI-wide design decisions, the CSCI architectural design, and the detailed design needed to implement the software are contained in the SDD. The SDD is used as the basis for implementing software. It provides the acquirer visibility into the design and provides information needed for software support. SDDs may be supplemented by Interface Design Descriptions (IDDs).

Systems Engineering Plan (SEP). The SEP is the blueprint for the conduct, management and control of the technical aspects of an acquisition program from conception to disposal.

Software Programmer's Manual. Information needed by a programmer to program a given piece of software.

Software Requirements Specification (SRS). The SRS specifies the requirements for a Computer Software Configuration Item (CSCI) and the methods to be used to ensure that each requirement has been met. Requirements pertaining to the CSCI external interfaces may be presented in the SRS or in one or more Interface IRS referenced from the SRS. The SRS, possibly supplemented by the IRS, is used as the basis for design and qualification testing of a CSCI.

Software Version Description (SVD). The SVD identifies and describes a SW version; used to release, track and control each version.

System Allocation Document Approved documentation that describes the allocation of requirements from the system specification to individual CIs.

System/Subsystem Design Description (SSDD). The SSDD describes the system/subsystem-wide design and the architectural design of a system/subsystem. The SSDD may be supplemented by IDDs and Database Design Document. The Database Design Document, with its associated IDDs, is used as the basis for further system/subsystem development. Design pertaining to interfaces may be presented in the SSDD or Database Design Documents.

Software Development Plan (SDP). The SDP describes the software development effort, processes, methods, schedules, organization and resources.

Software Support Plan. This plan describes the sum of all activities that take place to ensure that implemented and fielded software continues to fully support the operational mission of the system.

Software Test Plan (STP). The STP describes plans for qualification testing of CSCIs and software systems. It describes the software test environment to be used for the testing, identifies the tests to be performed, and provides schedules for test activities. There is usually a single STP for a project. The STP enables the acquirer to assess the adequacy of planning for CSCI and, if applicable, software system qualification testing.

Software Users Manual (SUM). The SUM is a document that details how the hands-on user installs and uses software, a software item group, a software system or subsystem.

Supportability Plan. The Supportability Plan is the comprehensive logistics support document that summarizes the results of logistics analysis, planning and acquisition. Based on the complexity of the program, a Supportability Plan may not need to be developed if sufficient logistics information can be provided in Chapter 7 of the MC-SAMP.

Technical Review Action Plan. The document produced to capture all planning for a technical review

Technical Review Handbook (TRH). This handbook

Technical Review Summary Report. The document produced as a result of a technical review. It contains the technical findings as well as the critical RFAs.

Version Description Document. See Software Version Description

Appendix C
System Requirements Review (SRR)

C-1 Overview

The System Requirements Review (SRR) is a multi-disciplined product and process assessment to ensure that the system under review can proceed into the System Development and Demonstration (SDD) phase, and that all system and performance requirements derived from the Capability Development Document (CDD) are defined and consistent with cost (program budget), schedule (program schedule), risk, and other system constraints. Generally this review assesses the system requirements as captured in the system specification, and ensures that the system requirements are consistent with the preferred system solution as well as available technologies resulting from the Technology Development phase. Of critical importance to this review is the understanding of program technical risk inherent in the system specification and SDD phase program plan. Acceptable level of risk is key to a successful review.

Evaluate the system's requirements to determine whether they are fully defined, sufficiently well understood and consistent with the preferred system solution, and whether traceability of system's requirements to the CDD is maintained. A successful review is predicated on the review team's determination that the system requirements, preferred system concept, available technology, and program resources (funding, schedule, staffing, and processes) form a satisfactory basis for proceeding into the SDD phase.

Tailor the review in accordance with the technical scope and risk of the system. Describe any tailoring in the SEP.

Completion of this review should provide the following:
> (1) An approved system specification
> (2) A preliminary allocation of system requirements to hardware, human, and software subsystems
> (3) Identification of all software components (tactical, support, deliverable, non-deliverable, etc.)
> (4) A comprehensive risk assessment for System Development and Demonstration
> (5) An approved System Development and Demonstration Phase Systems Engineering Plan that addresses cost and critical path drivers
> (6) An approved Product Support Plan with updates applicable to this phase

Notwithstanding successful completion of the SRR, the contractor remains responsible for the system design/performance requirements within the terms of the contract.

C-2 Timing

Conduct the SRR near the conclusion of the Technology Development phase, following full Concept Refinement definition, completion of Technology Development definition, and prior to Milestone B (program initiation). In the competitive environment, with multiple contractors competing, conduct SRRs with all contractors. Conduct an additional SRR, if needed, as an initial technical review of the System Development and Demonstration phase for the purposes of establishing the technical baseline and approach. Do not schedule the

SRR at a particular number of months after contract award; rather, SRR should occur relative to the maturity of the system technical baseline as described above.

C-3   SRR Entrance Criteria

The following are typical Entrance Criteria:

(1) If applicable, an Alternative Systems Review (ASR) has been successfully completed.

(2) A preliminary agenda has been coordinated (nominally) 30 days prior to the SRR.

(3) SRR technical products listed below for both hardware and software system elements have been made available to the cognizant SRR participants prior to the review:

    (a) System specification

    (b) System software functionality description

    (c) Preferred system solution definition

    (d) Updated risk assessment

    (e) SEP

    (f) Updated cost and schedule data

    (g) Updated logistics documentation

    (h) Updated Human Systems Integration related documentation

    (i) Software Development Plan is complete. May be a standard organizational or company document tailored to the program

    (j) System architecture (hardware, software, human, material as necessary)

    (k) Integrated system architecture and supporting views (System Views (SV) and Technical Views (TV))

(4) All applicable CDRLs are accepted

C-4   SRR Review Elements

Each SRR will be unique depending on the scope and complexity of the program. What follows is a general list of elements that should be considered for inclusion in the SRR. The list is neither prescriptive nor all inclusive.

(1) Introduction / agenda / administrative

    (a) Purpose of review, including scope/boundaries of the review

    (b) Review of entrance criteria

    (c) RFA procedures overview

    (d) Program overview

    (e) Family of Systems/System of Systems overview

    (f) Review of metrics used for Technical Management

(2) A System Requirements Review, usually in the form of a presentation, of the following as appropriate

    (a) Mission and Requirements Analysis

    (b) Functional Flow Analysis

(c) Preliminary Requirements Allocation

(d) System/Cost Effectiveness Analysis

(e) Trade studies (e.g. addressing system functions in mission and support hardware/firmware/software)

(f) Synthesis

(g) Logistics Support Analysis

(h) Specialty Discipline Studies (i.e., hardware and software reliability analysis, maintainability analysis, armament integration, electromagnetic compatibility, survivability/vulnerability (including nuclear), inspection methods/techniques analysis, energy management, environmental considerations)

(i) System Interface Studies

(j) Generation of Specification

(k) Program Risk Analysis

(l) Integrated Test Planning

(m) Producibility Analysis Plans

(n) Technical Performance Measurement Planning

(o) Engineering Integration

(p) Data Management Plans

(q) Configuration Management Plans

(r) Environment, Safety and Occupational Health (ESOH) Planning

(s) Human Factors Analysis

(t) Value Engineering Studies

(u) Life Cycle Cost Analysis

(v) Preliminary Manufacturing Plans

(w) Manpower Requirements/Personnel Analysis

(x) Milestone Schedules

During the SRR the contractor shall describe his progress and problems in each of the following areas:

(1) Risk identification and risk ranking (the inter- relationship among system effectiveness analysis, technical performance measurement, intended manufacturing methods, and costs shall be discussed, as appropriate)

(2) Risk avoidance/reduction and control (the inter- relationships with trade-off studies, test planning, hardware proofing, and technical performance measurement shall be discussed, as appropriate)

(3) Significant trade-offs among stated system/subsystem specification requirements/constraints and resulting engineering design requirements/constraints, manufacturing methods/process constraints, and logistic/cost of ownership requirements/ constraints and unit production cost/design-to-cost objectives

(4) Identifying computer resources of the system and partitioning the system into Hardware Configuration Items (HWCIs) and Computer Software Configuration Items (CSCIs). Include any trade-off studies conducted to evaluate alternative approaches and methods for meeting operational needs and to determine the effects of constraints on the system. Also include any evaluations of logistics, technology, cost, schedule, resource limitations, intelligence estimates, etc., made to determine their impact on the system. In addition, address the following specific trade-offs related to computer resources

   (a) Candidate programming languages and computer architectures evaluated in light of Department of Defense (DoD) requirements for approved higher order languages and standard instruction set architectures

   (b) Alternative approaches evaluated for implementing security requirements. If an approach has been selected, discuss how it is the most economical balance of elements which meet the total system requirements

   (c) Alternative approaches identified for achieving the operational and support concepts, and, for joint service programs, opportunities for interservice support

(5) Producibility and manufacturing considerations which could impact the program decision such as critical components, materials and processes, tooling and test equipment development, production testing methods, long lead items, and facilities/ personnel/skills requirements

(6) Significant hazard consideration should be made here to develop requirements and constraints to eliminate or control these system associated hazards

(7) Information which the contractor identifies as being useful to his analysis and available through the contracting agency shall be requested prior to this review (e.g., prior studies, operational/support factors, cost factors, ESOH data, test plan(s), etc.). A separate SRR may be conducted for each of the operational support subsystems depending upon the nature and complexity of the program

C-5   SRR Exit Criteria

Consider the SRR closed when the event has been completed, the exit criteria have been met and all the critical RFAs are closed.

The following are typical Exit Criteria:

   (1) Are the system requirements, as disclosed, traceable back to the approved requirements in the CDD?

   (2) Are the system requirements sufficiently detailed and understood to enable system functional definition and functional decomposition?

   (3) Are the Family of System/System of Systems (FoS/SoS) requirements properly allocated and approved?

   (4) Is there an approved system specification?

   (5) Are adequate processes and metrics in place for the program to succeed?

   (6) Have Human Systems Integration requirements been reviewed and included, where needed, in the overall system design?

(7) Are the risks known and manageable for design and development?

(8) Is the program schedule executable (technical/cost risks)?

(9) Is the program properly staffed?

(10) Is the program executable within the existing budget?

(11) Does the updated cost estimate fit with in the existing budget?

(12) Is the software functionality in the system specification consistent with the software sizing estimates and the resource-loaded schedule?

(13) Did the Technology Development phase sufficiently reduce development risks?

(14) Were the proper independent subject matter experts at the review

Appendix D
System Functional Review (SFR)

D-1   Overview

The System Functional Review (SFR) is a multi-disciplined product and process assessment to ensure that the system under review can proceed into preliminary design, and that all system requirements and functional performance requirements derived from the Capability Development Document (CDD) are defined and consistent with cost (program budget), schedule (program schedule), risk, and other system constraints. Generally this review assesses the system functional requirements as captured in system specifications (functional baseline), and ensures that all required system performance is fully decomposed and defined in the functional baseline. System performance may be decomposed and traced to lower level subsystem functionality that may define hardware and software requirements. SFR determines whether the systems functional definition is fully decomposed to its lowest level, and that the developer is prepared to start preliminary design.

The system's lower level performance requirements are evaluated to determine whether they are fully defined and consistent with the preferred system concept, and whether traceability of lower-level systems requirements to top-level system performance and the CDD is maintained. A successful review is predicated on the review team's determination that the system performance requirements, lower level performance requirements and plans for design and development form a satisfactory basis for proceeding into preliminary design.

Tailor the review in accordance with the technical scope and risk of the system. Describe any tailoring in the program's SEP. The SFR has importance as the last review that ensures that the system is credible and feasible before more technical design work commences. Notwithstanding successful completion of the SFR, the contractor remains responsible for the system design/performance requirements within the terms of the contract.

Completion of this review should provide the following:
  (1) An established system functional baseline
  (2) An updated risk assessment for the System Development and Demonstration phase
  (3) An updated program development schedule including system and software critical path drivers
  (4) An approved Product Support Plan with updates applicable to this phase

D-2   Timing

The SFR is typically conducted early in the System Development and Demonstration phase, following full system functional definition, completion of preliminary functional baseline documentation, and prior to preliminary design activity. The SFR should not be scheduled at a particular number of months after contract award; rather, SFR should occur relative to the maturity of the system technical baseline as described above.

D-3   SFR Entrance Criteria

The following are typical Entrance Criteria:

    (1) If applicable, a System Requirements Review has been successfully completed

    (2) A preliminary agenda has been coordinated (nominally) 30 days prior to the SFR

    (3) SFR technical products listed below for both hardware and software system elements have been made available to the cognizant SFR participants prior to the review

        (a) Updated system specification

        (b) Preliminary functional baseline (with supporting trade-off analyses and data)

        (c) Preliminary system software functional requirements

        (d) Systems Engineering Plan changes, if any

        (e) Updated risk assessment

        (f) Updated logistics documentation (Supportability Plan, Logistics Requirements Funding Summary (LRFS), Preliminary Maintenance Plan, etc.)

        (g) Based on system complexity, updated Human Systems Integration plan

    (4) Is the Software Test Plan (STP) complete and ready to be placed under configuration management?

    (5) Are the Software Requirements Specification(s) (SRS) complete and ready to be placed under configuration management?

    (6) Are the Interface Requirements Specification(s) (IRS) complete and ready to be placed under configuration management?

    (7) Are the software requirements and interface requirements to be implemented in each incremental software build and/or released identified?

D-4   SFR Review Elements

Each SFR will be unique depending on the scope and complexity of the program. What follows is a general list of elements that should be considered for inclusion in the SFR. The list is neither prescriptive nor all inclusive.

    (1) Introduction / agenda / administrative

        (a)   Purpose of review, including scope/boundaries of the review

        (b)   Review of entrance criteria

        (c)   RFA procedures overview

        (d)   Program overview

        (e)   Family of Systems/System of Systems overview

    (2) A System Functional Review, usually in the form of a presentation, of the following as appropriate:

        (a)   Mission and Requirements Analysis

        (b)   Functional Analysis

        (c)   Requirements Allocation

        (d)   System/Cost Effectiveness

        (e)   Synthesis

(f)	Survivability/Vulnerability
(g)	Reliability/Maintainability/Availability
(h)	Electromagnetic Compatibility
(i)	Logistic Support Analysis to address, as appropriate, integrated logistics support including maintenance concept, support equipment concept, logistics support concept, maintenance, supply, software support facilities, etc. (MIL-STD-1388-1 and 2)
(j)	ESOH Analysis (emphasis shall be placed on system hazard analysis and identification of related safety test requirements)
(k)	Security
(l)	Human Factors
(m)	Transportability (including Packaging and Handling)
(n)	System Mass Properties
(o)	Standardization
(p)	Electronic Warfare
(q)	Value Engineering
(r)	System Growth Capability
(s)	Program Risk Analysis
(t)	Technical Performance Measurement Planning
(u)	Producibility Analysis and Manufacturing
(v)	Life Cycle Cost/Design to Cost Goals
(w)	Quality Assurance Program
(x)	Environmental Conditions (Temperature, Vibration, Shock, Humidity, etc)
(y)	Training and Training Support
(z)	Milestone Schedules
(aa)	Software Development Procedures
(bb)	Results of significant trade studies
(cc)	Updated design requirements for operations/maintenance functions and items
(dd)	Updated requirements for manufacturing methods and processes
(ee)	Updated operations/maintenance requirements for facilities
(ff)	Updated requirements for operations/maintenance personnel and training

D-5   SFR Exit Criteria

Consider the SFR closed when the event has been completed, the exit criteria have been met and all the critical RFAs are closed.

Typical Exit Criteria include:

(1) The SRR is considered complete when all draft RFAs are signed off, and an acceptable level of program risk is ascertained

(2) Typical Exit Criteria include:

    (a)   Can the system functional requirements, as disclosed, satisfy the CDD?

(b)   Are the system functional requirements sufficiently detailed and understood to enable system design to proceed?

(c)   Are adequate processes and metrics in place for the program to succeed?

(d)   Are the risks known and manageable for design and development?

(e)   Is the program schedule executable (technical/cost risks)?

(f)   Is the program properly staffed?

(g)   Is the program with the approved functional baseline executable within the existing budget?

(h)   Does the updated cost estimate fit within the existing budget?

(i)   Has the System Functional Baseline been established to enable preliminary design to proceed with proper Configuration Management?

(j)   Is the software functionality in the approved functional baseline consistent with the updated software metrics and resource loaded schedule?

(k)   Have all appropriate documents been updated and put under CM control?

Appendix E
Preliminary Design Review (PDR)

E-1   Overview

The Preliminary Design Review (PDR) is a multi-disciplined product and process assessment to ensure that the system under review can proceed into detailed design, and can meet the stated performance requirements within cost (program budget), schedule (program schedule), risk, and other system constraints. Generally this review assesses the system preliminary design as captured in development specifications for each configuration item in the system (allocated baseline), and ensures that each function in the functional baseline has been allocated to one or more system configuration items. Configuration items may consist of both hardware and software elements

Completion of this review should provide the following:
 (1) An established allocated baseline
 (2) An updated risk assessment for the development program
 (3) An updated program development schedule including system and software critical path drivers
 (4) An updated Supportability Plan or Chapter 7 of the Marine Corps System Acquisition Management Plan (MC-SAMP)

Notwithstanding successful completion of the PDR, the contractor remains responsible for the system design/performance requirements within the terms of the contract.

E-2   Incremental PDRs

For complex systems, the program manager may conduct a PDR for each subsystem or configuration item, leading to an overall system PDR. When individual reviews have been conducted, the emphasis of the overall system PDR should focus on configuration item functional and physical interface design, as well as overall system design requirements. The PDR determines whether the hardware, human, and software preliminary designs are complete, and whether the Integrated Product Team is prepared to start detailed design and test procedure development.

The PDR evaluates the set of subsystem requirements to determine whether they correctly and completely implement all system requirements allocated to the subsystem. The PDR also determines whether subsystem requirements trace with the system design. At this review the review team should review the results of peer reviews of requirements and preliminary design documentation. A successful review is predicated on the review team's determination that the subsystem requirements, subsystem preliminary design, results of peer reviews, and plans for development and testing form a satisfactory basis for proceeding into detailed design and test procedure development.

E-3   Timing

The PDR is typically conducted during the System Integration work effort of the System Development and Demonstration phase, following preliminary design, completion of preliminary allocated baseline documentation, and prior to detailed design activity. The PDR should not be scheduled at a particular number of months after contract award; rather, PDR should occur relative to the maturity of the system technical baseline as described above. According to the MCSC Develop and Demonstrate Process Handbook, a rule-of-thumb for requisite system maturity at PDR would be when nominally 15% of the design drawings have been released from engineering to manufacturing.

E-4 PDR Entrance Criteria

The following are typical Entrance Criteria:

(1) A System Functional Review (SFR) has been successfully conducted

(2) All SFR exit criteria have been satisfied and all SFR Critical RFAs have been closed

(3) A preliminary agenda has been coordinated (nominally) 30 days prior to the PDR

(4) PDR technical products (hardware and software elements of the product baseline to be reviewed and approved at the PDR) have been made available to the cognizant PDR participants prior to the review. Some examples might be:

    (a) Updates to the system specification, to include a description of interoperability and/or distributed services requirements

    (b) Preliminary subsystem development specifications for each hardware and software configuration item, along with supporting trade-off analyses and data. The preliminary software development specification must include a completed definition of the software architecture, and a preliminary database design description, as applicable

(5) PDR programmatic products have been updated and have been made available prior to the review or will be reviewed at the PDR. Some examples might be:

    (a) Program risk assessment

    (b) Systems Engineering Plan (SEP) changes (if any)

    (c) Updated logistics documentation (MC-SAMP Chapter 7, Software Support Plan (SSP), etc.)

    (d) Updated Human Systems Integration related documentation

    (e) Updated integrated system architecture and supporting views (SVs and TVs)

    (f) Updated program schedule

(6) All applicable CDRLs are accepted

E-5 PDR Review Elements

Each PDR will be unique depending on the scope and complexity of the program. What follows is a general list of elements that should be considered for inclusion in the PDR. The list is neither prescriptive nor all inclusive.

(1) Introduction / agenda / administrative

(a) Purpose of review, including scope/boundaries of the review

(b) Review of entrance criteria

(c) RFA procedures overview

(d) Program overview

(e) Family of Systems/System of Systems overview

(f) Review of metrics used for Technical Management

(g) Review of risks currently being managed

(2) A Preliminary Design Review, usually in the form of a presentation, of the following (MIL-STD-1521B, Appendix D provides additional items to be reviewed):

All Configuration Items

(a) Adequacy of the preliminary design in the following areas:

1. Environment control and thermal design aspects
2. Electromagnetic compatibility of the preliminary design
3. Power distribution and grounding design aspects
4. Preliminary mechanical and packaging design of consoles, racks, drawers, printed circuit boards, connectors, etc.
5. ESOH engineering considerations
6. Security engineering considerations
7. Survivability/Vulnerability (including nuclear) considerations
8. Preliminary lists of materials, parts, and processes
9. Pertinent reliability/maintainability/availability data
10. Preliminary weight data
11. Development test data
12. Support equipment requirements.
13. Armament compatibility
14. Corrosion prevention/control considerations
15. Transportability, packaging, and handling considerations
16. Standardization considerations
17. Human Engineering and Biomedical considerations (including life support and Crew Station Requirements)

(b) Life Cycle Cost Analysis

(c) Findings/Status of Quality Assurance Program

Hardware Configuration Items

(a) Preliminary design synthesis of the Hardware Development Specification for the item being reviewed

(b) Trade-studies and design studies results

(c) Functional flow, requirements allocation data, and schematic diagrams

(d) Equipment layout drawings and preliminary drawings, including any proprietary or restricted design/process/ components and information

(e) Interface requirements contained in configuration item development specifications and interface control data (e.g., interface control drawings) derived from these requirements

(f) Configuration item development schedule

(g) Mock-ups, models, breadboards, or prototype hardware when appropriate

(h) Producibility and Manufacturing Considerations (e.g., materials, tooling, test equipment, processes, facilities, skills, and inspection techniques). Identify single source, sole source, diminishing source

(i) Value Engineering Considerations, Preliminary Value Engineering Change Proposals (VECPs) and VECPs (if applicable)

(j) Description and characteristics of commercially available equipment, including any optional capabilities such as special features, interface units, special instructions, controls, formats, etc., (include limitations of commercially available equipment such as failure to meet human engineering, ESOH, and maintainability requirements of the specification and identify deficiencies)

(k) Existing documentation (technical orders, commercial manuals, etc.,) for commercially available equipment and copies of contractor specifications used to procure equipment shall be made available for review by the contracting agency

(l) Firmware to be provided with the system: microprogram logic diagrams and reprogramming/instruction translation algorithm descriptions, fabrication, packaging (integration technology, device types, and special equipment and support software needed for developing, testing, and supporting the firmware

Computer Software Configuration Items

(a) Functional flow. The computer software functional flow embodying all of the requirements allocated from the Software Requirements Specification and Interface Requirements Specification(s) to the individual Top-Level Software Units (TLSU) of the CSCI

(b) Storage allocation data. This information shall be presented for each CSCI as a whole, describing the manner in which available storage is allocated to individual TLSUs. Timing, sequencing requirements, and relevant equipment constraints used in determining the allocation are to be included

(c) Control functions description. A description of the executive control and start/recovery features for the CSCI shall be available, including method of initiating system operation and features enabling recovery from system malfunction

(d) CSCI structure. The contractor shall describe the top-level structure of the CSCI, the reasons for choosing the components described, the development methodology which will be used within the constraints of the available

computer resources, and any support programs which will be required in order to develop/maintain the CSCI structure and allocation of data storage

(e) Security. An identification of unique security requirements and a description of the techniques to be used for implementing and maintaining security within the CSCI shall be provided. An appropriate level of Information Assurance posture shall be included in the Program Protection Plan

(f) Re-entrancy. An identification of any re-entrancy requirements and a description of the techniques for implementing re-entry routines shall be available

(g) Computer software development facilities. The availability, adequacy, and planned utilization of the computer software development facilities shall be addressed

(h) Computer software development facility versus the operational system. The contractor shall provide information relative to unique design features which may exist in a TLSU in order to allow use within the computer software development facility, but which will not exist in the TLSU installed in the operational system. The contractor shall provide information on the design of support programs not explicitly required for the operational system but which will be generated to assist in the development of the CSCI(s). The contractor shall also provide details of the Software Development Library controls

(i) Development tools. The contractor shall describe any special simulation, data reduction, or utility tools that are not delivered under the terms of the contract, but which are planned for use during software development

(j) Test tools. The contractor shall describe any special test systems, test data, data reduction tools, test computer software, or calibration and diagnostic software that are not deliverable under terms of the contract, but which are planned for use during product development

(k) Description and characteristics of commercially available computer resources, including any optional capabilities such as special features, interface units, special instructions, controls, formats, etc. Include limitations of commercially available equipment such as failure to meet human engineering, ESOH and maintainability requirements of the specification and identify deficiencies

(l) Existing documentation (technical orders, commercial manuals, etc.) for commercially available computer resources and copies of contractor specifications used to procure computer resources shall be made available for review by the contracting agency

(m) Support resources. The contractor shall describe those resources necessary to support the software and firmware during operational deployment of the system, such as operational and support hardware and software, personnel, special skills, human factors, configuration management, test, and facilities/space

(n) Operation and support documents. The preliminary versions of the Computer System Operator's Manual (CSOM), Software User's Manual (SUM), Computer System Diagnostic Manual (CSDM), and Computer Resources

Integrated Support Document (CRISD) shall be reviewed for technical content and compatibility with the top-level design documentation

(o) Updated since the last review to all previously delivered software related CDRL items

Support Equipment

(a) Review requirements for Support Equipment (SE) based on HWCI and CSCI reviews

(b) Verify testability analysis results. For example, on repairable integrated circuit boards are test points available so that failure can be isolated to the lowest level of repair

(c) Verify that the Government furnished SE is planned to be used to the maximum extent possible

(d) Review progress of long-lead time SE items, identified through interim release and SE Requirements Document (SERD) procedures

(e) Review progress toward determining total SE requirements for installation, checkout, and test support requirements

(f) Review the reliability/maintainability/availability of support equipment items

(g) Identify logistic support requirements for support equipment items and rationale for their selection

(h) Review calibration requirements

(i) Describe technical manuals and data availability for support equipment

(j) Verify compatibility of proposed support equipment with the system maintenance concept

(k) If a Logistic Support Analysis (LSA) is not done, then review the results of SE trade-off studies for each alternative support concept. For existing SE and printed circuit boards testers, review Maintainability data resulting from the field use of these equipments. Review the cost difference between systems using single or multipurpose SE vs. proposed new SE. Examine technical feasibility in using existing, developmental, and proposed new SE. For mobile systems, review the mobility requirements of support equipment

(l) Review the relationship of the computer resources in the system/subsystem with those in Automatic Test Equipment. Relate this to the development of Built-In Test Equipment and try to reduce the need for complex supporting SE

(m) Verify on-equipment versus off-equipment maintenance task trade study results, including support equipment impacts

(n) Review updated list of required support equipment

Testing

(a) Review all changes to the System/Subsystem, HWCI Development, Software Requirements, and Interface Requirements Specifications subsequent to the established allocated baseline to determine whether Section 4.0 of all these specifications adequately reflects these changes

(b) Review information to be provided by the contractor regarding test concepts for Development Test and Evaluation (DT&E) testing (both informal and formal). Information shall include:

1. The organization and responsibilities of the group that will be responsible for test
2. The management of his in-house development test effort provides for:
   a. Test Methods (plans/procedures)
   b. Test Reports
   c. Resolution of problems and errors
   d. Retest procedure
   e. Change control and configuration management
   f. Identification of any special test tools that are not deliverable under the contract.
3. The methodology to be used to meet quality assurance requirements/qualification requirements, including the test repeatability characteristics and approach to regression testing.
4. The progress/status of the test effort since the previous reporting milestone

(c) Review status of all negative or provisional entries such as "not applicable (N/A)" or "to be determined (TBD)" in Section 4.0 of the System/Subsystem, hardware Development, Software Requirements or Interface Requirements Specifications. Review all positive entries for technical adequacy. Insure that associated test documentation includes these changes

(d) Review interface test requirements specified in Section 4.0 of the hardware Development, Software Requirements, and Interface Requirements Specifications for compatibility, currency, technical adequacy, elimination of redundant test. Insure that all associated test documents reflect these interface requirements

(e) Insure that all test planning documentation has been updated to include new test support requirements and provisions for long-lead time support requirements

(f) Review contractor test data from prior testing to determine if such data negates the need for additional testing

(g) Examine all available breadboards, mock-ups, or devices which will be used in implementing the test program or which affect the test program, for program impact

(h) Review plans for software Unit testing to ensure that they:

1. Address Unit level sizing, timing, and accuracy requirements
2. Present general and specific requirements that will be demonstrated by Unit testing
3. Describe the required test-unique support software, hardware, and facilities and the interrelationship of these items
4. Describe how, when, and from where the test-unique support items will be obtained

5. Provide test schedules consistent with higher level plans

(i) Review plans for CSCI integration testing to ensure that they:

1. Define the type of testing required for each level of the software structure above the unit level

2. Present general and specific requirements that will be demonstrated by CSCI integration testing

3. Describe the required test-unique support software, hardware, and facilities and the interrelationship of these items

4. Describe how, when, and from where the test-unique support items will be obtained

5. Describe CSCI integration test management, to include:

   a. Organization and responsibilities of the test team

   b. Control procedures to be applied during test

   c. Test reporting

   d. Review of CSCI integration test results

   e. Generation of data to be used in CSCI integration testing

6. Provide test schedules consistent with higher level plans

(j) Review plans for formal CSCI testing to ensure that they:

1. Define the objective of each CSCI test, and relate the test to the software requirements being tested

2. Relate formal CSCI tests to other test phases

3. Describe support software, hardware, and facilities required for CSCI testing; and how, when, and from where they will be obtained

4. Describe CSCI test roles and responsibilities

5. Describe requirements for Government-provided software, hardware, facilities, data, and documentation

6. Provide CSCI test schedules consistent with higher- level plans

7. Identify software requirements that will be verified by each formal CSCI test

E-6   PDR Exit Criteria

Consider the PDR closed when the event has been completed, the exit criteria have been met and all the critical RFAs are closed.

Typical Exit Criteria include:

(1)   Can the preliminary design, as disclosed, satisfy the CDD as translated into the system specification?

(2)   Does the status of the technical effort and design indicate Operational Evaluation (OPEVAL) success (operationally suitable and effective)?

(3)   Does the integrated architecture System and Technical Views (SVs and TVs) support, and are consistent with, the appropriate Operational architecture, the CDD, the Information Support Plan (ISP) and the Net-Ready Key Performance Parameter (NR-KPP)?

(4)   Has the allocated baseline been established and documented to enable detailed design to proceed with proper configuration management?

(5)   Are adequate processes and metrics in place for the program to succeed?

(6)   Are the risks known and manageable?

(7)   Is the program schedule executable (technical/cost risks)?

(8)   Is the program properly staffed?

(9)   Is the program executable with the existing budget and with the approved allocated baseline?

(10)   Does the updated cost estimate fit within the existing budget?

(11)   Is the preliminary design producible within the production budget?

(12)   Have Human Integration design factors been reviewed and included, where needed, in the overall system design?

(13)   Is the software functionality in the approved allocated baseline consistent with the updated software metrics and resource-loaded schedule?

(14)   Were the proper independent subject matter experts at the review?

Appendix F
Critical Design Review (CDR)

F-1   Overview

The Critical Design Review (CDR) is a multi-disciplined product and process assessment to ensure that the system under review can proceed into system fabrication, demonstration, and test, and can meet the stated performance requirements within cost (program budget), program schedule, risk, and other system constraints. Generally this review assesses the system final design as captured in product specifications for each configuration item in the system (product baseline), and ensures that each product in the product baseline has been captured in the detailed design documentation. Product specifications for hardware enable the fabrication of configuration items, and may include production drawings. Product specifications for software (e.g. Software Design Description (SDD)) enable coding of a Computer Software Configuration Item (CSCI). Configuration items may consist of both hardware and software elements.

Completion of the CDR should provide the following:
    (1) An established product baseline
    (2) An updated risk assessment for the development program
    (3) An updated program development schedule including fabrication, test, and software coding critical path drivers
    (4) An updated Supportability Plan or Chapter 7 of the Marine Corps Single Acquisition Management Plan (MC-SAMP)

Notwithstanding successful completion of the CDR, the contractor remains responsible for the system design/performance requirements within the terms of the contract.

F-2   Software CDRs

The CDR for a CSCI shall be a formal technical review of the CSCI detail design, including database and interfaces. The CDR is normally accomplished for the purpose of establishing integrity of computer software design at the level of a Unit's logical design prior to coding and testing. The CDR may be accomplished at a single review meeting or in increments during the development process corresponding to periods at which components or groups of components reach the completion of logical design. The primary product of the CDR is a formal identification of specific software documentation which will be released for coding and testing. By mutual agreement between the contractor and the contracting agency, CDRs may be scheduled concurrently for two or more CSCIs.

F-3   Incremental CDRs

For complex systems, a CDR may be conducted for each subsystem and/or configuration item. These incremental reviews would lead up to an overall system CDR. When incremental reviews have been conducted, the emphasis of the overall system CDR should be

on configuration item functional and physical interface detail design, as well as overall system detail design requirements. The CDR determines whether the hardware and software final detail designs are complete, and the contractor is prepared to start system fabrication, coding, demonstration and test.

The subsystem detailed designs are evaluated to determine whether they correctly and completely implement all system requirements allocated to the subsystem, and whether the traceability of final subsystem requirements to final system detail design is maintained. At this review the review team shall also review the results of peer reviews on requirements and final detail design documentation, and ensure that latest estimates of cost (development, production, and support) are consistent with the detail design. A successful review is predicated on the review team's determination that the subsystem requirements, subsystem detail design, results of peer reviews, and plans for testing form a satisfactory basis for proceeding into system fabrication or software coding, demonstration and test. The CDR should occur at the point in the design where the "build-to" baseline has been achieved, allowing production, and coding of software deliverables to proceed.
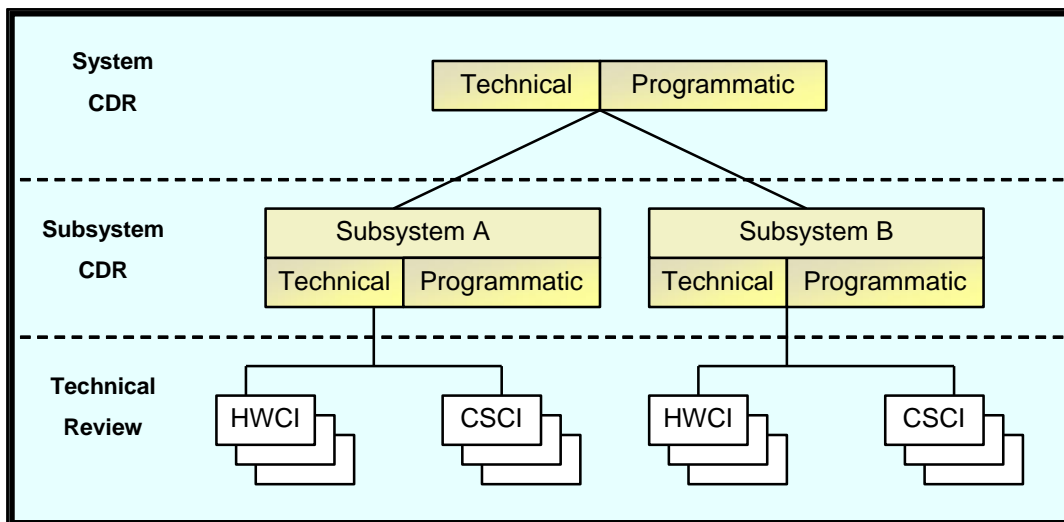

Figure F-1 Incremental CDR Build-Up

F-4   Timing

The CDR is typically conducted during the System Development and Demonstration phase, at the transition point from System Integration to System Demonstration. The CDR generally occurs after completion of final design efforts and product baseline documentation, and prior to system fabrication and testing. The CDR should not be scheduled at a particular number of months after contract award; rather, CDR should occur relative to the maturity of the system technical baseline as described above. According to the MCSC Develop and Demonstrate Process Handbook, a rule-of-thumb for requisite system maturity at CDR would be when nominally 90% of the design drawings have been released from engineering to manufacturing.

F-5   CDR Entrance Criteria

The following are typical Entrance Criteria:

 (1) PDR has been successfully conducted

 (2) All PDR exit criteria have been satisfied and all PDR Critical RFAs have been closed

 (3) A preliminary agenda has been coordinated (nominally) 30 days prior to the CDR

 (4) A Technology Readiness Assessment (TRA), if applicable, has been completed

 (5) CDR technical products (hardware and software elements of the product baseline to be reviewed and approved at the CDR) have been made available to the cognizant CDR participants prior to the review. Some examples might be:

  (a) Updates to the systems specification

  (b) Product specifications for each hardware and software configuration item, along with supporting trade-off analyses and data

  (c) Software Design Description complete and ready to be placed under configuration management

  (d) Preliminary test procedures for software integration and systems testing

  (e) Human Systems Integration related documentation has been updated

  (f) Interface Design Description(s) (IDD) is complete and ready to be placed under configuration management

 (6) CDR programmatic products have been updated and have been made available prior to the review or will be reviewed at the CDR. Some examples might be:

  (a) Program risk assessment

  (b) Systems Engineering Plan changes (if any)

  (c) Updated logistics documentation (MC-SAMP Chapter 7, Software Support Plan (SSP), etc.)

  (d) Updated program schedule

 (7) All applicable CDRLs are accepted

F-6 CDR Review Elements

Each CDR will be unique depending on the scope and complexity of the program. What follows is a general list of elements that should be considered for inclusion in the CDR. The list is neither prescriptive nor all inclusive.

 (1) Introduction / agenda / administrative

  (a) Purpose of review, including scope/boundaries of the review

  (b) Review of entrance criteria

  (c) Review of exit criteria

  (d) RFA procedures overview

  (e) Program overview

  (f) Family of Systems/System of Systems overview

  (g) Review of metrics used for Technical Management

  (h) Review of risks currently being managed

(2) A Critical Design Review, usually in the form of a presentation, of the following (MIL-STD-1521B, Appendix E provides additional items to be reviewed):

Hardware Configuration Items

(a) Adequacy of the detail design reflected in the draft Hardware Product Specification in satisfying the requirements of the HWCI Development Specification for the item being reviewed

(b) Detail engineering drawings for the HWCI including schematic diagrams

(c) Adequacy of the detailed design in the following areas:
1. Electrical design
2. Mechanical design
3. Environmental control and thermal aspects
4. Electromagnetic compatibility
5. Power generation and grounding
6. Electrical and mechanical interface compatibility
7. Mass properties
8. Reliability/Maintainability/Availability
9. ESOH Engineering
10. Security Engineering
11. Survivability/Vulnerability (including nuclear)
12. Producibility and Manufacturing
13. Transportability, Packaging and handling
14. Human Engineering and Biomedical Requirements
15. Standardization
16. Design versus Logistics Trade-offs
17. Support equipment requirements

(d) Interface control drawings

(e) Mock-ups, breadboards, and/or prototype hardware

(f) Design analysis and test data

(g) System Allocation Document for HWCI inclusion at each scheduled location

(h) Initial Manufacturing Readiness (for example, manufacturing engineering, tooling demonstrations, development and proofing of new materials, processes, methods, tooling, test equipment, procedures, reduction of manufacturing risks to acceptable levels)

(i) Preliminary VECPs and/or formal VECPs

(j) Life cycle costs

(k) Detail design information on all firmware to be provided with the system

(l) Findings/Status of Quality Assurance Program

(m) Technology Readiness Assessment/Technology Readiness Level

Computer Software Configuration Items

(a) Software Detailed Design, Data Base Design, and Interface Design Description(s). In cases where the CDR is conducted in increments, complete documents to support that increment shall be available

(b) Supporting documentation describing results of analyses, testing, etc., as mutually agreed by the contracting agency and the contractor

(c) System Allocation Document for CSCI inclusion at each scheduled location

(d) Computer Resources Integrated Support Document

(e) Software Programmer's Manual

(f) Firmware Support Manual

(g) Progress on activities required by CSCI PDR (see E-5.(2))

(h) Updated operation and support documents (Computer System Operators Manual, Software Users Manual, Computer System Diagnostics Manual)

(i) Schedules for remaining milestones

(j) Updates since the last review to all previously delivered software related Contract Data Requirements List items

(k) Technology Readiness Assessment/Software Technology Readiness Level

Support Equipment

(a) Review requirements for Support Equipment (SE) based on HWCI and CSCI reviews

(b) Verify maximum considerations Government Furnished Equipment Support Equipment

(c) Identify existing or potential SE provisioning problems

(d) Determine qualitative and quantitative adequacy of provisioning drawings and data

(e) Review reliability of SE

(f) Review logistic support requirements for SE items

(g) Review Calibration requirements

(h) Review documentation for SE

Testing

(a) Review all available test documentation for currency, technical adequacy, and compatibility with Section 4.0 of contractual specification

(b) Review all test documentation required to support test requirements

(c) Review software test descriptions for consistency with the Software Test Plan

F-7   CDR Exit Criteria

Consider the CDR closed when the event has been completed, the exit criteria have been met and all the critical RFAs are closed.

Typical Exit Criteria include the following:

(1) Does the detailed design, as disclosed, satisfy the CDD as translated into the system specification?

(2) Does the status of the technical effort and design indicate OPEVAL success (operationally suitable and effective)?

(3) Does the integrated architecture System and Technical Views (SVs and TVs) support, and are consistent with, the appropriate operational architecture, the CDD, the ISP and NR-KPP?

(4) Has the product baseline been established and documented to enable hardware fabrication and software coding to proceed with proper configuration management?

(5) Are adequate processes and metrics in place for the program to succeed?

(6) Are the risks known and manageable?

(7) Is the program schedule executable (technical/cost risks)?

(8) Is the program properly staffed?

(9) Is the program executable with the existing budget and the approved product baseline?

(10) Is the detailed design producible within the production budget?

(11) Does the updated cost estimate fit within the existing budget?

(12) Is the software functionality in the approved product baseline consistent with the updated software metrics and resource-loaded schedule?

(13) Have key product characteristics having the most impact on system performance, assembly, cost, reliability, or safety been identified?

(14) Have the critical manufacturing processes that impact the key characteristics been identified and their capability to meet design tolerances determined?

(15) Have process control plans been developed for critical manufacturing processes?

(16) Has sufficient test planning been accomplished to allow system and sub-system level testing to begin?

(17) Were the proper independent subject matter experts at the review?

Appendix G
Test Readiness Review (TRR)

G-1   Overview

The Test Readiness Review (TRR) is a multi-disciplined product and process assessment to ensure that the subsystem, system, or systems of systems under review is ready to proceed into formal test. The TRR assesses test objectives, test methods and procedures, scope of tests, and determines if required test resources have been properly identified and coordinated to support planned tests. The TRR verifies the traceability of planned tests to program requirements. The TRR determines the completeness of test procedures and their compliance with test plans and descriptions. The TRR assesses the system under review for development maturity, cost/ schedule effectiveness, and risk to determine readiness to proceed to formal testing. The TRR must be planned, managed, and followed up to be an effective system analysis and control tool.

Test and Evaluation (T&E) is an integral part of the systems engineering process (critical element of system analysis and control; part of the verification loop). As such, just as the Systems Engineering process permeates the entire life cycle of an acquisition program so too does T&E. T&E is an important tool to identify and control risk. Although this appendix principally addresses the TRR specified in the DoD 5000 series instructions to support a readiness for a system to proceed into system level Developmental Test (DT), the TRR process is equally applicable to all tests in all phases of an acquisition program. PM's and their respective T&E Integrated Product Team's (IPT's) should tailor the requirements specified herein to the specific acquisition phase, the specific planned tests, and the identified risk level of their respective programs. The level of specific risk and risk level will vary as a system proceeds from component level, to system level, to systems of systems level testing. A robust test program will greatly enhance the PM's ability to identify and manage risk. The degree of review a given set of tests should receive is directly related to the risk level associated with performing the planned tests and the importance of the test results to overall program success. Early component level test may not require the same level of review as the final system or system of system level tests. Sound judgment based on an appreciation of the risk level and the potential impact of the tests to program success should be important factors in deciding at what level and how formal a Test Readiness Review should be for a specific test or series of tests.

Readiness to convene a TRR is predicated on the Program/IPT's determination that preliminary testing, functional testing, and pre-qualification testing results form a satisfactory basis for proceeding with a TRR and initiation of formal system level DT.

Tailor the TRR in accordance with the technical scope and risk of the system under test. Describe any tailoring in the program's SEP.

The TRR should answer the following questions:

(1) Why are we testing? What is the purpose of the planned test? Does the planned test verify a requirement that is directly traceable back to a system specification or other program requirement?

(2) What are we testing (subsystem, system, system of systems, other)? Is the configuration of the system under test sufficiently mature, defined, and representative to accomplish planned test objectives and or support defined program objectives

(3) Are we ready to begin testing? Have all planned preliminary, informal, functional, unit level, subsystem, system, and qualification tests been conducted, and are the results satisfactory? Do the software metrics reflect a maturity level consistent with entering system level testing?

(4) What is the expected result and how can/do the test results affect the program?

(5) Is the planned test properly resourced (people, test article or articles, facilities, data systems, support equipment, logistics, etc.)?

(6) What are the risks associated with the tests and how are they being mitigated?

(7) What is the fall-back plan should a technical issue or potential showstopper arise during testing?

(8) Do the testers know what functional capability is provided in order to design their tests? Are the developers aware of what will be tested and what the pass/fail criteria will be used? Are the developers confident the system will pass the testing? Are the testers confident the system will pass testing?

G-2   Timing

The TRR is typically conducted during the System Demonstration phase effort of the System Development and Demonstration phase. Like other technical reviews, the TRR should be event driven and should not be scheduled at a particular number of months after contract award; but rather, should occur relative to the readiness of the system under test to begin the subsystem, system, or systems of systems level Development Test required to support the overall program T&E and Risk management plans.

G-3   TRR Entrance Criteria

The following are typical Entrance Criteria:

(1) Configuration of system under test, including software, has been defined and agreed to. All interfaces have been placed under configuration management or have been defined in accordance with an agreed to plan and a Version Description Document has been made available to TRR participants (minimum of 7 working days prior to review)

(2) All applicable functional, unit level, subsystem, system, and qualification testing has been conducted successfully

(3) All TRR specific materials such as test plans, test cases, and procedures have been available to all participants prior to conducting the review (minimum of 7 working days)

(4) All known system discrepancies have been identified and dispositioned in accordance with an agreed to plan

(5) All previous design review exit criteria and key issues have been satisfied in accordance with an agreed to plan

(6) Test requirements have been documented and are fully traceable to system, engineering, operational or program requirements

(7) All required test resources (people, facilities, test articles, test instrumentation) have been identified and are available to support required tests

(8) Roles and responsibilities of all test participants are defined and agreed to

(9) All applicable CDRLs are accepted

G-4   TRR Review Elements

Each TRR will be unique depending on the scope and complexity of the program. What follows is a general list of elements that should be considered for inclusion in the TRR. The list is neither prescriptive nor all inclusive.

(1) Introduction / agenda / administrative

    (a) Purpose of review, including scope/boundaries of the review

    (b) Review of entrance criteria

    (c) RFA procedures overview

    (d) Program overview and how planned test support the overall program

(2) Test Program Overview, including the test schedule

(3) Test Program Staffing including organizational structure and key government/contractor interfaces

(4) Preliminary or informal test results

    (a) Identify any preliminary testing that has already been conducted

    (b) Identify any outstanding discrepancies as a result of any preliminary / informal testing previously conducted

(5) A review of the following:

    (a) **Requirements changes.** Any changes to the Software Requirements Specification or Interface Requirements Specification(s) that have been approved since SSR, and which impact CSCI testing

    (b) **Design changes**. Any changes to the Software Design Description, Data Base Design Description, or Interface Design Descriptions) that have been made since PDR and CDR, and which impact CSCI testing

    (c) **Software test plans and descriptions**. Any changes to approved Software Test Plans and Software Test Descriptions

    (d) **Software test procedures**. Test procedures to be used in conducting CSCI testing, including retest procedures for test anomalies and corrections

    (e) **Software Unit test cases, procedures, and results**. Software Unit integration test cases and procedures used in conducting informal Software Unit tests and the test results

    (f) **Software test resources**. Status of the development facility hardware, Government Furnished Software, test personnel, and supporting test software and materials, including software test tool qualification and review of the traceability between requirements and their associated tests

(g) **Test limitations**. Identification of all software test limitations

(h) **Software problems**. Summary of software problem status including all known discrepancies of the CSCI and test support software

(i) **Schedules**. Schedules for remaining milestones

(j) Documentation Updates. Updates to all evolving and previously delivered CDRL items (e.g., CSOM, SUM, CSDM)

G-5   TRR Exit Criteria

The TRR is considered closed when the event has been completed, the exit criteria have been met and all the critical RFAs are closed.

Typical Exit Criteria include:

(1)   Test requirements are traceable, documented and approved. Adequate test plans based on these traceable requirements are completed and approved for the system under test

(2)   Software and hardware test descriptions and procedures are defined, verified and baselined

(3)   Planned testing is consistent with defined incremental approach including regression testing

(4)   All test facilities and resources (including testers, (lab test stations, hardware, and software) are ready and available to support software and hardware testing within the defined schedule

(5)   The software and hardware being tested and the entire test environment is configuration controlled as applicable

(6)   All lower level software and hardware testing has been successfully completed and documented

(7)   Software and hardware metrics show readiness for testing

(8)   Software and hardware problem report system is defined and implemented

(9)   Software and hardware test baseline is established and controlled

(10) Software and hardware development estimates are updated

(11) Requirements that cannot be adequately tested at the CSCI and HWCI level (and thus require testing at the subsystem or system levels) are identified.

(12) Risk level identified and accepted by Program / Competency leadership as required

(13) Testers have a high degree of confidence that the system under test will pass the testing successfully and agree that the anomalies, limitations, and vulnerabilities will not impact this

(14) The developers are aware of the testers' plans and have a high degree of confidence that the system under test will pass the testing successfully

Appendix H
System Verification Review (SVR)

H-1   Overview

The SVR (synonymous with Functional Configuration Audit) is a multi-disciplined technical review to ensure that the system under review can proceed into Low-Rate Initial Production and Full-Rate Production within cost (program budget), schedule (program schedule), risk, and other system constraints. Generally this review is an audit trail from the Critical Design Review. It assesses the system final product, as evidenced in its production configuration, and determines if it meets the functional requirements (derived from the Capability Development Document and draft Capability Production Document) documented in the functional, allocated, and product baselines. The SVR establishes and verifies final product performance. It provides inputs to the Capability Production Document. The SVR is often conducted concurrently with the Production Readiness Review.

Tailor the SVR in accordance with the technical scope and risk of the system under test. Describe any tailoring in the program's SEP.

H-2   Timing

The SVR for a complex configuration item may be conducted on a progressive basis, when so specified by the contracting agency, throughout the configuration item's development and culminates at the completion of the qualification testing of the configuration item with a review of all discrepancies at the final SVR. Conduct the SVR on that configuration of the configuration item which is representative (prototype or preproduction) of the configuration to be released for production of the operational inventory quantities. When a prototype or preproduction article is not produced, conduct the SVR on a first production article. For cases where configuration item qualification can only be determined through integrated system testing, SVRs for such configuration items will not be considered complete until completion of such integrated testing.

H-3   SVR Entrance Criteria

The following are typical Entrance Criteria:

    (1) A Critical Design Review (CDR) has been successfully conducted

    (2) All CDR exit criteria have been satisfied and all CDR Critical RFAs have been closed

    (3) A preliminary agenda has been coordinated (nominally) 30 days prior to the SVR

    (4) All system specification qualification test requirements have been successfully completed, if applicable

    (5) SVR technical products (hardware and software elements of the product baseline to be reviewed and approved at the SVR) have been made available to the cognizant SVR participants prior to the review

    (6) SVR programmatic products have been updated and have been made available prior to the review or will be reviewed at the SVR. Some examples might be:

        (a) Program risk assessment

(b) Systems Engineering Plan (SEP) changes (if any)

(c) Updated logistics documentation (MC-SAMP Chapter 7, Software Support Plan (SSP), etc.)

(d) Updated program schedule

(7) All applicable CDRLs are accepted

H-4   SVR Review Elements

Each SVR will be unique depending on the scope and complexity of the program. What follows is a general list of elements that to consider for inclusion in the SVR. The list is neither prescriptive nor all inclusive.

(1) Introduction / agenda / administrative

    (a) Purpose of review, including scope/boundaries of the review

    (b) Review of entrance criteria

    (c) RFA procedures overview

    (d) Program overview/status

(2) A review of the following for each configuration item:

    (a) Nomenclature

    (b) Specification Identification number

    (c) Configuration item number

    (d) Current listing of all deviations against the configuration item, either requested of, or approved by the contracting agency.

    (e) Status of Test Program to test configured items with automatic test equipment (when applicable)

(3) For CSCIs the following additional information should be reviewed:

    (a) The contractor shall provide the SVR team with a briefing for each CSCI being reviewed and shall delineate the test results and findings for each CSCI. As a minimum, the discussion shall include CSCI requirements that were not met, including a proposed solution to each item, an account of the Engineering Change Proposals (ECPs) incorporated and tested as well as proposed, and a general presentation of the entire CSCI test effort delineating problem areas as well as accomplishments

    (b) A review of the formal test plans/descriptions/ procedures shall be made and compared against the official test data. The results shall be checked for completeness and accuracy. Deficiencies shall be documented and made a part of the SVR minutes. Completion dates for all discrepancies shall be clearly established and documented

    (c) A review of the Software Test Reports shall be performed to validate that the reports are accurate and completely describe the CSCI tests

    (d) All ECPs that have been approved shall be reviewed to ensure that they have been technically incorporated and verified

    (e) All updates to previously delivered documents shall be reviewed to ensure accuracy and consistency throughout the documentation set

(f) Preliminary and Critical Design Review minutes shall be examined to ensure that all findings have been incorporated and completed

(g) The interface requirements and the testing of these requirements shall be reviewed for CSCIs

(h) Review data base characteristics, storage allocation data and timing, and sequencing characteristics for compliance with specified requirements

H-5 SVR Exit Criteria

Consider the SVR closed when the event has been completed, the exit criteria have been met and all the critical RFAs are closed.

Typical Exit Criteria include:

(1) Does the status of the technical effort and system indicate operational test success (operationally suitable and effective)?

(2) Can the system, as it exists, satisfy the Capability Development Document/draft Capability Production Document?

(3) Are adequate processes and metrics in place for the program to succeed?

(4) Are the risks known and manageable?

(5) Is the program schedule executable within the anticipated cost and technical risks?

(6) Are the system requirements understood to the level appropriate for this review?

(7) Is the program properly staffed?

(8) Is the program's Non Recurring Engineering requirement executable with the existing budget?

(9) Is the system producible within the production budget?

Appendix I
Production Readiness Review (PRR)

I-1 Overview
The Production Readiness Review (PRR) is an examination of a program to determine if the design is ready for production and the producer has accomplished adequate production planning without incurring unacceptable risks that will breach thresholds of schedule, performance, cost or other established criteria. The full, production-configured system is evaluated to determine that it correctly and completely implements all system requirements, and whether the traceability of final system requirements to the final production system is maintained. At this review the review team shall also review the readiness of the manufacturing processes, the Quality System, and the production planning, i.e. facilities, tooling and test equipment capacity, personnel development and certification, process documentation, inventory management, supplier management, etc. A successful review is predicated on the review team's determination that the system requirements are fully met in the final production configuration, and that production capability form a satisfactory basis for proceeding into Low Rate Initial Production (LRIP) and Full Rate Production (FRP). The PRR is often conducted concurrently with the System Verification Review.

Tailor the PRR in accordance with the technical scope and risk of the system under test. Describe any tailoring in the program's SEP.

I-2 Timing
Conduct the PRR(s) on the prime contractor and on major subcontractors, as applicable. Conduct the PRR in an iterative manner concurrent with other major program reviews, such as SFR, PDR, and CDR, during the System Development and Demonstration (SDD) phase. Conducted these periodic production readiness assessments during the System Demonstration work effort to identify and mitigate risks as the design progresses, with a final PRR conducted at the completion of System Development and Demonstration phase.

A follow-on tailored PRR may also be appropriate in the production phase for the prime contractor and major subcontractors for:
> (1) Changes from the System Development and Demonstration phase and during the production phase of the design, materials and manufacturing processes
> (2) Production start-up after a significant shut-down period
> (3) Production start-up with a new contractor
> (4) Relocation of a manufacturing site

I-3 PRR Entrance Criteria
The following are typical Entrance Criteria:
> (1) A preliminary agenda has been coordinated (nominally) 30 days prior to the PRR
> (2) PRR technical products have been made available to the cognizant PRR participants prior to the review. Some examples might be:
> (a) Results of the PRRs conducted at the major suppliers

        (b) Transition to Production and/or Manufacturing Plan

        (c) Change control process has been established and the customer has approved the production configuration baseline

        (d) Manufacturing/Producibility and Quality requirements have been addressed during the design/development phase

    (3) PRR programmatic products have been updated and have been made available prior to the review or will be reviewed at the PRR. Some examples might be:

        (a) Program risk assessment

        (b) Systems Engineering Plan changes (if any)

        (c) Updated logistics documentation (MC-SAMP Chapter 7, Software Support Plan, etc.)

        (d) Updated program schedule

    (4) All applicable CDRLs are accepted

I-4   PRR Review Elements

Each PRR will be unique depending on the scope and complexity of the program. What follows is a general list of elements that should be considered for inclusion in the PRR. The list is neither prescriptive nor all inclusive.

    (1) Introduction / agenda / administrative

        (a) Purpose of review, including scope/boundaries of the review

        (b) Review of entrance criteria

        (c) RFA procedures overview

        (d) Program overview/status

    (2) A review of the following areas:

        (a) Program Management

        (b) Engineering/Product Design

        (c) Production Engineering and Planning

        (d) Production Facilities Readiness

        (e) Materials and Purchased Parts

        (f) Industrial Resources

        (g) Quality Assurance

        (h) Logistics

        (i) Software Management

I-5   PRR Exit Criteria

Consider the PRR closed when the event has been completed, the exit criteria have been met and all the critical RFAs are closed.

Typical Exit Criteria include:

    (1) Has the product baseline been established and documented to enable hardware fabrication and software coding to proceed with proper configuration management?

    (2) Are adequate processes and metrics in place for the program to succeed?

    (3) Are the risks known and manageable?

(4) Is the program schedule executable (technical/cost risks)?
(5) Is the program properly staffed?
(6) Is the detailed design producible within the production budget?

Appendix J
Physical Configuration Review (PCR)

J-1   Overview

The purpose of a Physical Configuration Review (PCR) (also called Audit) is to examine the actual configuration of an item being produced in order to verify that the related design documentation matches the item as specified in the contract. In addition to the standard practice of assuring product verification, the PCR confirms that the manufacturing processes, quality control system, measurement and test equipment, and training are adequately planned, followed and controlled. It is also used to validate many of the supporting processes used by the contractor in the production of the item and to verify other elements of the item that may have been impacted/redesigned after completion of the System Verification Review. A PCR is normally conducted when the government plans to control the detail design of the item it is acquiring via the Technical Data Package (TDP). When the government does not plan to exercise such control or purchase the item's TDP (e.g. performance based procurement) the contractor must still conduct an internal PCR in order to define the starting point for controlling the detail design of the item and to establish a product baseline.

J-2   Timing

The PCR shall be conducted on the first article of configuration items and those that are a reprocurement of a configuration item already in the inventory shall be identified and selected jointly by the contracting agency and the contractor. A PCR shall be conducted on the first configuration item to be delivered by a new contractor even though PCR was previously accomplished on the first article delivered by a different contractor.

A new production contract or an Engineering Change Proposal (ECP) may call for the development of a new item and incorporation of the new item into a system via a modification program. The expected configuration, performance and Technical Data Package of the new item will have to be verified by the conduct of a PCR.

Depending on whether the acquisition strategy was based on a detail design or performance design specification could influence whether the PCR is to be conducted by the contractor or government.

J-3   PCR Entrance Criteria

The following are typical Entrance Criteria:

(1) A Production Readiness Review (PRR) has been successfully conducted

(2) All PRR exit criteria have been satisfied and all PRR Critical RFAs have been closed

(3) A preliminary agenda has been coordinated (nominally) 30 days prior to the PCR

(4) PCR technical products have been made available to the cognizant PCR participants prior to the review

(a) Results of the PCRs conducted at the major suppliers

(b) Manufacturing Plan

(c) Quality Control Plan, and

(d) Current risk assessment

J-4   PCR Review Elements

Each PCR will be unique depending on the scope and complexity of the program. What follows is a general list of elements that should be considered for inclusion in the SVR. The list is neither prescriptive nor all inclusive.

(1) Introduction / agenda / administrative

    (a) Purpose of review, including scope/boundaries of the review

    (b) Review of entrance criteria

    (c) RFA procedures overview

    (d) Program overview/status

(2) The PCR cannot be performed unless data pertinent to the configuration item being audited is provided to the PCR team at time of the audit. The contractor shall compile and make this information available for ready reference. Required information shall include:

    (a) Configuration item product specification

    (b) A list delineating both approved and outstanding changes against the configuration item

    (c) Complete shortage list

    (d) Acceptance test procedures and associated test data

    (e) Engineering drawing index including revision letters

    (f) Operating, maintenance, and illustrated parts breakdown manuals

    (g) Proposed DD Form 250, "Material Inspection and Receiving Report"

    (h) Approved nomenclature and nameplates

    (i) Software Programmer's Manuals, Software User's Manuals, Computer System Operator's Manual, Computer System Diagnostic Manual, and Firmware Support Manual

    (j) Software Version Description Document

    (k) SVR minutes for each configuration item

    (l) Findings/Status of Quality Assurance Programs

(3) The contractor shall assemble and make available to the PCR team at time of audit all data describing the item configuration. Item configuration data shall include:

    (a) Current approved issue of Hardware Development Specification, Software Requirements Specification, and Interface Requirements Specification(s) to

include approved specification change notices and approved deviations/ waivers

(b) Identification of all changes actually made during test

(c) Identification of all required changes not completed

(d) All approved drawings and documents by the top drawing number as identified in the configuration item product specification. All drawings shall be of the category and form specified in the contract

(e) Manufacturing instruction sheets for HWCIs identified by the contracting agency

(4) The contractor shall identify any difference between the physical configurations of the selected production unit and the Development Unit(s) used for the SVR and shall certify or demonstrate to the Government that these differences do not degrade the functional characteristics of the selected units

J-5   PCR Exit Criteria

The PCR is considered closed when the event has been completed, the exit criteria have been met and all the critical RFAs are closed.

Typical Exit Criteria include:

(1) The design and manufacturing documentation matches the item as specified in the contract

(2) Results approved by the PCR Executive Panel or Co-Chairs

Appendix K: Sample RFA Form

Request for Action / Request for Information		
Program Name :		
Contractor Name :		
Title:	____RFA ____RFI	Log #:
Issue:		
Recommended Action / Information Requested: Closure Criteria:		
Originator:		Date of Request:
Originator's Phone:	Originator's Email:	
Need Date / Milestone:		

Following Section for Use by Technical Review Board Only

_____ Critical RFA (Required for CDR Closure) _____ Not Critical RFA, Not Required for CDR Closure _____ Request for Information (RFI) _____ Out of Scope / Response Not Required	
Action Assigned To:	Due Date: Event Milestone:
TRB Chairman Approval:	Date: